ISRAELI POST-PRIMARIY TEACHER`S ATTITUDES TOWARDS TEACHING MATHEMATICS

Abdallah Asli

Abstract. Attitudes of teachers towards teaching mathematics and the anxiety that accompanies mathematics teaching are well known in the literature as important factors that influence pupils' attitude towards mathematics and their mathematical achievement. It is important to note that most of the research done in this subject has examined the attitudes of teachers and students in primary schools. The purpose of this study is to investigate the attitude towards teaching mathematics of mathematics teachers in post primary schools in Israel.The research was conducted in 2021 in Israel. The participants are 221 mathematics teachers from post primary schools. The research instrument was a questionnaire developed for this study based on the scientific literature and aimed to find out teachers' attitudes towards teaching mathematics and applications of Mathematics in other disciplines. The results show that majority of the teachers have high level of positive attitudes towards teaching mathematics, but there are also teachers whose attitudes need to be developed. Teachers with little experience and young age feel more anxiety in teaching mathematics. As well as teachers that feel anxiety have less support and less innovation in teaching mathematics. It is surprising that there are no correlations and connections between anxiety and confident and enjoyment in teaching mathematics.

Keywords: teachers` attitudes, teaching anxiety, confident and enjoyment in teaching, confident in mathematics, burnout, innovation, feeling support

1. Introduction

Attitude of mathematics teachers towards teaching mathematics is a very important issue, as it influences the methods used by the teacher, which has impact on pupils' attitude towards mathematics (Relich and Way, 1994; Skemp, 1976; Tuimavana and Datt, 2017) and their mathematics achievement (Relich and Way, 1994). Skemp (1976) argued that the development of positive attitudes to mathematics is dependent on the type of teaching. Skemp spoke about relational and instrumental understanding. Relational understanding involves knowing both what to do and why it works, while instrumental understanding involves knowing only what to do, the rule, but not the reason why the rule works. Negative attitudes can be generated by a mismatch which occurs when the teacher teaches instrumentally, and the student tries to understand relationally. Many people believe that in order to teach math well, teachers need positive attitudes towards the subject and that the task of improving the attitudes towards mathematics of the future elementary teachers start at the university (Sherman and Christian, 1999).

Most of the studies that have examined teachers' attitudes towards teaching mathematics have been done on primary school teachers. This could be explained by the fact that for these teachers mathematics is only one of the subjects they teach, so they not necessarily have a positive attitude towards mathematics and good mathematical skills.

The research presented in this paper dealt with Israeli mathematics teachers' attitude towards teaching mathematics in post-primary schools. Due to the importance of teachers' attitude toward teaching mathematics, in Israel a survey of attitude towards mathematics teaching is conducted annually among elementary school teachers and students during national mathematics exam. These exams begin with a questionnaire for assessing students' attitude towards teaching mathematics. Therefore, most of the research in the field in Israel has been done on teachers and students from elementary schools. Thus,

the research among post-primary school mathematics teachers in Israel on attitude towards teaching mathematics is important and it could lead to new results in the topic.

2. Literature review

In this section a literary review of several articles that have dealt with researching the attitudes of teachers towards teaching mathematics is presented.

The results of Tuimavana and Datt research (2017) showed that positive attitudes of mathematics teachers, their beliefs as well as their behavior and teaching strategies have a strong impact on students' attitudes, i.e. positive attitudes of teachers lead to positive attitudes of students.

Maria (1992) emphasized that there is a positive effect of teachers' attitudes towards mathematics and mathematics teaching on student. Karp (1991) showed that the attitudes of mathematics teachers influence students both in learning math and in students' attitudes toward teaching math. They noted that students' experiences in classrooms of teachers with positive attitudes are fundamentally different from those of students in classrooms of teachers with negative attitudes in terms of learning abilities and motivation. Teachers with a negative attitude towards mathematics used methods that encouraged dependence to the teacher, while teachers with positive attitudes were found to encourage student initiative and independence.

The behavior of teachers with negative attitudes caused the student to depend on the teacher in terms of organizing the content of the lesson and choosing the methods to solve the problems for getting the "one correct answer". This type of instructions reinforces the belief that the teacher is the only source of information in the student's views. Thus, students became passive learners, with mechanical copying.

In contrast, teachers with positive attitudes toward mathematics teaching used teaching methods that encouraged students' independent learning. They were more likely to deal with the development of thinking skills and solving mathematical problems. In addition, students research and discover mathematical meanings and interactions instead of receiving information passively and they are able to respond better to new situations and applications and success in mathematical tasks that last for a longer period. Teachers with positive attitudes also incorporated materials and representations that provide students with resources other than self-instruction. The teachers distanced the students from the dependence on the teachers by offering the students to mentally imagine the materials that had been manipulated in the past and the models of the teacher.

Akkaya and Memnun (2012) have shown that the attitudes of mathematics teachers towards teaching mathematics have a long-term impact on mathematics education and the student's academic, emotional and behavioral development.

Attitudes towards mathematics are also an important variable, navigating students' behaviors regarding mathematics lessons and having a contribution to their motivation, in other words, it can be considered as a determinant of personal emotions (Bayturan, 2004, Reyes, 1984; Ma, 1997). It is showed that people with positive attitudes towards teaching mathematics are more successful than people with negative attitudes.

There are many reasons why students show negative attitudes towards math lessons, such as: students can`t understand math, students are insecure, students feel anxiety about math and teachers are one of the most important factors. Teachers are actually a major reason that causes students to exhibit negative attitudes toward math. So that positive attitudes of teachers cause positive attitudes of students and vice versa (Yıldızlar, 2001).

What is also important is that there is a negative relationship between students' attitudes towards mathematics and anxiety about mathematics. Anxiety about mathematics is also influenced by various factors, such as: psychological and emotional figures, personal reasons, and also reasons related to the teacher's teaching methods (Terwilliger and Titus, 1995).

The teacher is a factor that develops students' attitudes towards mathematics. Positive attitudes about mathematics affect the success of students in a positive way in the future and in academics.

Tabuk (2018) has shown that teachers 'attitudes towards mathematics are important and affect students' attitudes and achievements in mathematics. because there is a significant relationship between teachers' attitudes towards teaching mathematics and their teaching methods. As a result there is a strong influence between students' attitudes and their achievements.

Ernest (1989) argues that teachers' attitudes towards mathematics may influence their enthusiasm and confidence towards teaching mathematics. This in turn may affect the classroom ethos and consequently affect their students' perceptions of mathematics. The teaching strategies used to help students to improve their understanding and attitudes were similar to the ones suggested for their future use in teaching children (Amato, 2004).

From a different perspective, there is a correlation between mathematical anxiety and the attitude towards the subject. Students that have high mathematical anxiety usually have a negative attitude towards mathematics and their success rate in mathematics is quite low (Peker and Mirasyedioğlu, 2008).

3. Methodology

3.1 Aim of the research

This study aims to find out teachers' attitude towards teaching mathematics in post primary schools from Israel.

3.2 Research instrument

The research instrument was a questionnaire developed for this study based on the scientific literature. The questionnaire is designed for the purpose of surveying teachers' attitudes and opinion on teaching mathematics and teaching applications of Mathematics in other disciplines.

The questionnaire consists of two main parts: demographical part and questions related with the research topic. The demographical part contains 10 questions, most of them closed. The second part contains 31 questions, all of the questions are closed questions (affirmations measured on a 5-level Likert scale, from 1 = strongly disagree to 5 = strongly agree).

A factor analysis was performed and a six-factor model with 22 items was obtained (Asli and Zsoldos-Marchis, 2022). The obtained factors are the following: Mathematics teaching anxiety, Confident and enjoyment of teaching mathematics, Burnout as mathematics teacher, Innovation in teaching, Confidence in mathematics, and Feeling Support.

3.3 Participants

221 mathematics teachers from Israelian post primary schools have participated in the study. The participation was voluntary. All participants answered all questions of the questionnaire.

The mean age of the participants was 41.1 years and the mean teaching experience 16 years.

The demographics of these participants are listed in Table 1. Two-thirds of the participants are female teachers, most of the participants are Arab. Almost half of the participants have BSc degree and half MSc degree. as regarding the level participants teach, more than half of them teach in high-school and the other participants teach in middle school.

Table 1. Demographic characteristics of participants

Variable		Frequency	Percent
Gender	Male	82	37%
	Female	139	63%
Nationality	Arab	201	91%
	Jewish	20	9%
Degree	BSc degree	99	44.8%
	MSc degree	119	53.8%

	PhD degree	3	2.4%
Level of class they teach	Middle school teachers	99	44.8%
	High school teachers	122	55.2%
Level of computer and technology control	Excellent	85	38.5%
	Good	108	48.9%
	Medium	28	12.7%
Type of school in which they teach	Theoretical	183	82.8%
	Religious	3	1.4%
	Technology	23	10.4%
	Private	12	5.4%

3.4. Data Analysis

The questions were quantitatively analyzed using SPSS program. The results include descriptive statistics (frequency, percentage, mean (M), and standard deviation (SD)), comparisons and correlations between the factors. Statistical test that are use: T test, F test, one way ANOVA, and correlations.

4. Results

4.1. Descriptive

In order to determine the correlations between the factors and the variables, we cross tabulated the factors with each other.

Table 2 outline the descriptive of the six factors include means and standard deviations.

Table 2. Descriptive Statistics of the six factors

	N	Minimum	Maximum	Mean	Std. Deviation
Anxiety	221	1.17	5.00	3.4382	.89397
confident and enjoyment in teaching	221	3.00	5.00	4.6161	.41541
Burnout	221	1.00	5.00	2.4525	.98771
Innovation in teaching	221	1.00	5.00	4.1109	.73247
confident in mathematics	221	2.00	5.00	4.7579	.46122
Feeling Support	221	1.00	5.00	4.0837	.85467
Valid N (listwise)	221				

These results (Table 2) indicate that teachers are confident in mathematics and in teaching. The highest mean is for confident in mathematics and confident and enjoyment in teaching (the means are 4.75, respectively 4.61), from which can be concluded that the attitudes of most teachers in Israel to mathematics teaching are positive. It could be observed that the highest mean (4.75) is for confident in mathematics and the lowest mean is for burnout (2.45). The mean for mathematics teaching anxiety is above average (3.43).

Table 3 shows the analysis of the items in each of the six factors including means and standard deviation.

Table 3. Descriptive analysis of the items in the six factors

Anxiety	N	Min	Max	Mean	Std. Deviation
It annoys me, that many students find it difficult to learn math.	221	1.00	5.00	3.4570	1.28424
Preparing students for national examinations is stressful for me.	221	1.00	5.00	3.2443	1.20756
The high expectation of parents towards the mathematics teaching is stressful for me.	221	1.00	5.00	3.0226	1.24113
The thought that students/pupils will not meet curriculum/school targets in math worries me.	221	1.00	5.00	3.4796	1.08953

	N	Min	Max	Mean	Std. Deviation
The thought of not being able to motivate students to learn math bothers me.	221	1.00	5.00	3.5520	1.10505
Differences in students'/pupils' prior knowledge challenges me when preparing for math lessons.	221	1.00	5.00	3.8733	.82697
Valid N (listwise)	221				
Confident and enjoyment in teaching	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
I enjoy teaching math.	221	3.00	5.00	4.7783	.43764
Teaching math makes me feel satisfied.	221	3.00	5.00	4.6516	.56477
I have always done well and have success in mathematics classes.	221	3.00	5.00	4.5973	.54422
I feel, that I have a positive impact on my pupils' life.	221	3.00	5.00	4.4887	.60761
There is a good connection between me and the students.	221	3.00	5.00	4.6923	.51820
The principal of the school has a positive attitude towards me.	221	1.00	5.00	4.4887	.76640
Valid N (listwise)	221				
Burnout	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
I feel worn out in my work as a math teacher.	221	1.00	5.00	2.4072	1.29219
I feel a lot of pressure in my work as a math teacher.	221	1.00	5.00	3.1855	1.31667
I feel tired in my work as a math teacher.	221	1.00	5.00	2.5158	1.29192
Teaching math is very difficult for me.	221	1.00	5.00	1.7014	.97768
Valid N (listwise)	221				
Innovation in teaching	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
I am innovative in mathematics teaching.	221	1.00	5.00	4.2172	.75551
I use alternative mathematics teaching methods.	221	1.00	5.00	4.0045	.83936
Valid N (listwise)	221				
Confident in mathematics	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
I'm pretty good at math.	221	1.00	5.00	4.7195	.56651
I have the necessary mathematical knowledge for a successful teaching.	221	2.00	5.00	4.7964	.47595
Valid N (listwise)	221				
Feeling Support	**N**	**Min**	**Max**	**Mean**	**Std. Deviation**
If I run into math problems, I ask help from other teachers.	221	1.00	5.00	3.7557	1.16151
I feel, that there is a mutually supporting atmosphere between the math teachers at the school.	221	1.00	5.00	4.4118	.86216
Valid N (listwise)	221				

Analyzing the means and standard deviations for each item from the "anxiety" factor, the most stressful for teachers is the different competency level of the pupils from a class, and the less stressful is the parents' expectations.

The means obtained for the items in the "burnout" factor ranges from 1.7 to 3.1. Respondents don't find difficult to teach mathematics, but they feel pressure, probably from school principals and parents to achieve good results at national tests.

Regarding to the factors: "confident and enjoyment in teaching" and "confident in mathematics" the means of each item in the two factors ranges from 4.48 to 4.79. the results means that teachers in Israel are very confident in mathematics and very enjoyment in teaching mathematics.

Finally, analyzing the items of the factor "feeling support" the means of the items are 3.76 and 4.41. This means that there are supporting atmosphere between the mathematics teachers in the Israeli post primary schools.

4.2. Correlations

Correlations were calculated between the characteristics of the group of participants (age and years of experience in teaching) and the six factors. The results of the analysis are reported in Table 4.

Table 4. Correlations between age, experience and the six factors

		Age	Years of experience	Natio-nality	Anxiety	Confident and enjoyment in teaching	Burnout	Inno-vation in teaching	confident in mathematics	Feeling Support
Age	Pearson Correlation	1	.891**	.126	-.328**	-.041	-.130	-.136*	.016	-.242**
	Sig. (2-tailed)		.000	.062	.000	.543	.054	.043	.812	.000
	N	221	221	221	221	221	221	221	221	221
years of expe-rience	Pearson Correlation	.891**	1	.014	-.328**	-.003	-.165*	-.111	.028	-.223**
	Sig. (2-tailed)	.000		.837	.000	.961	.014	.100	.680	.001
	N	221	221	221	221	221	221	221	221	221
Nationa-lity	Pearson Correlation	.126	.014	1	-.046	-.082	-.025	-.102	-.091	-.003
	Sig. (2-tailed)	.062	.837		.497	.224	.714	.131	.177	.962
	N	221	221	221	221	221	221	221	221	221
Anxiety	Pearson Correlation	-.328**	-.328**	-.046	1	-.003	.321**	.211**	.065	.222**
	Sig. (2-tailed)	.000	.000	.497		.960	.000	.002	.339	.001
	N	221	221	221	221	221	221	221	221	221
Confi-dent and enjoyment in teaching	Pearson Correlation	-.041	-.003	-.082	-.003	1	-.245**	.401**	.345**	.189**
	Sig. (2-tailed)	.543	.961	.224	.960		.000	.000	.000	.005
	N	221	221	221	221	221	221	221	221	221
Burnout	Pearson Correlation	-.130	-.165*	-.025	.321**	-.245**	1	-.096	-.029	.127
	Sig. (2-tailed)	.054	.014	.714	.000	.000		.157	.667	.060
	N	221	221	221	221	221	221	221	221	221
Inno-vation in teaching	Pearson Correlation	-.136*	-.111	-.102	.211**	.401**	-.096	1	.245**	.072
	Sig. (2-tailed)	.043	.100	.131	.002	.000	.157		.000	.285
	N	221	221	221	221	221	221	221	221	221
confident in mathe-matics	Pearson Correlation	.016	.028	-.091	.065	.345**	-.029	.245**	1	.072
	Sig. (2-tailed)	.812	.680	.177	.339	.000	.667	.000		.288
	N	221	221	221	221	221	221	221	221	221
Feeling Support	Pearson Correlation	-.242**	-.223**	-.003	.222**	.189**	.127	.072	.072	1
	Sig. (2-tailed)	.000	.001	.962	.001	.005	.060	.285	.288	
	N	221	221	221	221	221	221	221	221	221
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed).										

Observing the results in Table 4, there is correlation between the age and teaching experience variable with the anxiety and feeling support factors. The older teachers are more experienced in teaching mathematics, also feels more supported. Teachers with little experience and young age feel more

anxiety in teaching math than teachers with greater experience and older age. Younger teachers are more innovative in teaching mathematics than older age teachers

In addition, there are some correlations between the factors of the scale:

- Teachers with more teaching anxiety are feeling more burnout.

- Teachers with less teaching anxiety are feeling more support and they are more innovative in teaching mathematics.

Teachers with confident and enjoyment in teaching mathematics are confident in mathematics, more innovation in teaching mathematics, feels more supported, also teachers with little confident and enjoyment in teaching mathematics feels more burnout.

The relationship between sex and feeling support in teaching mathematics is tested using independent sample T test as shown in table 5 below:

Table 5. Independent samples T test between sex and feeling support

	Sex	**N**	**Mean**	**Std. Deviation**	**Std. Error Mean**
Feeling Support	Male	82	3.7988	.88143	.09734
	female	139	4.2518	.79485	.06742

Independent Samples Test

		Levene's Test		t-test for Equality of Means						95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference		Lower	Upper
Feeling Support	Equal variances assumed	3.150	.077	-3.930	219	.000	-.45302	.11529		-.68023	-.22581
	Equal variances not assumed			-3.826	156.251	.000	-.45302	.11841		-.68690	-.21914

According to Table 5 we see that there is a significant difference between the means obtained by female and male teachers as regarding feeling support: Female teachers feel more support than male teachers in teaching mathematics (sig= 0.00 < 0.05).

Table 6 below shown one way ANOVA Test, that tested the relations between the six factors and level of computer and technology control.

Table 6. One way ANOVA between level of computer and the six factors.

		Sum of Squares	**Df**	**Mean Square**	**F**	**Sig.**
Anxiety	Between Groups	3.340	2	1.670	2.111	.124
	Within Groups	172.481	218	.791		
	Total	175.822	220			
confident and enjoyment in teaching	Between Groups	1.542	2	.771	4.616	.011
	Within Groups	36.421	218	.167		

	Total	37.964	220			
Burnout	Between Groups	2.353	2	1.176	1.208	.301
	Within Groups	212.273	218	.974		
	Total	214.626	220			
Innovation in teaching	Between Groups	15.327	2	7.663	16.266	.000
	Within Groups	102.707	218	.471		
	Total	118.034	220			
confident in mathematics	Between Groups	1.824	2	.912	4.421	.013
	Within Groups	44.975	218	.206		
	Total	46.799	220			
Feeling Support	Between Groups	1.787	2	.893	1.226	.296
	Within Groups	158.914	218	.729		
	Total	160.701	220			

According to the results of one-way ANOVA test (Table 6), we conclude that:

-Teachers with excellent level of computer and technology control are more confident and enjoyment in teaching mathematics than teachers with middle and low level of computer control.

-Teachers with excellent level of computer and technology control are more confident in mathematics than teachers with middle and low level of computer control.

-Teachers with excellent level of computer and technology control are more innovative in teaching than teachers with middle and low level of computer control.

5. Conclusions

The results from the analysis of the teachers` attitudes towards teaching mathematics scale data showed that most of the teachers are confident in mathematics, they are confident and feel enjoyment in teaching, they are innovative in teaching mathematics and feel support. On the other hand, only few teachers feel mathematics teaching anxiety and burnout from teaching mathematics.
There are some correlations between demographical data and the factors of the scale. Teachers with little experience and young age feel more anxiety in teaching mathematics than teachers with greater experience and older age and they are feeling less support and less innovation in teaching mathematics. Female teachers feel more support than male teachers in teaching mathematics. Teachers with excellent level of computer and technology control feel more confident and enjoyment in teaching, they are more innovative in teaching and more confident in their mathematical knowledge than teachers with middle and low level of computer control.

There are also some correlations between the factors of the scale. Teachers with confident and enjoyment in teaching mathematics feel more support in teaching mathematics, more confident in their mathematical knowledge and they are more innovation in teaching mathematics.

Bibliography

Amato, S.A. (2004): Improving student teachers` attitudes to mathematics. *Group for the Psychology of Mathematics Education*, 2, 25-32.

Asli. A., Zsoldos-Marchis I. (2022): "Teacher`s attitudes towards teaching mathematics" scale: factor analysis, *Proceedings of the 16th International Technology, Education and Development Conference,* 10190-10197, https://doi.org/10.21125/inted.2022.2680.

Bayturan, S. (2004): *Attitudes towards Mathematics of Mathematics Achievement of Secondary School Students, its relationship with psychosocial and sociodemographic characteristics.* (Unpublished Master Thesis) Dokuz Eylul University, Izmir

Ernest, P. (1989): The Knowledge, Beliefs and Attitudes of the Mathematics Teacher: a Model, *Journal of Education for Teaching*, *15*(1), 13-33.

Ertekin, E. (2010): Correlations between the mathematics teaching anxieties of pre-service primary education mathematics teachers and their beliefs about mathematics. *Educational Research and Reviews 5*(8), 446-454.

Fennema, E., Sherman, J. (1976): Fennema-Sherman mathematics attitude scales: Instruments designed to measure attitudes toward the learning of mathematics by females and males. *Psychological Documents (Ms No. 1225).* American Psychological Association, Washington, DC

Hunt, T. E., Sari, M. H. (2019): An English Version of the Mathematics Teaching Anxiety Scale, International *Journal of Assessment Tools in Education, 6*(3), 436-443, https://dx.doi.org/10.21449/ijate.615640

Karp, K.S. (1991): Elementary school teachers` attitudes towards mathematics: the impact on students Autonomous learning skills. *School of Education Adelphi University. Garden City, New York, 91(6) 265-270.*

Ma, X. (1997): Reciprocal relationships between attitude toward mathematics and achievement in mathematics. *The Journal of Educational Research, 90(4), 221-229.*

Maria, C. (1992): *Primary Teachers` attitudes towards mathematics and mathematics teaching with special reference to a logo-based in-service course.* Institute of Education, University of London.

Memnun, D.S., Akkaya, R. (2012): Pre-Service teachers` attitudes towards mathematics in Turkey. *International Journal of humanities social science, 9*(2), 90-99.

Peker, M., Mirasyedioğlu, S. (2008): Pre-Service Elementary School Teachers' Learning Styles and Attitudes towards Mathematics. Eurasia Journal of Mathematics, *Science and Technology Education, Turkey 4*(1), 21-26.

Relich. J., Way, J., Martin, A. (1994): Attitudes to Teaching Mathematics: Further Development of a Measurement Instrument,.*1*(6), 56-69. *University of Western Sydney, Nepean.*

Reyes, L. H. (1984): Affective variables and mathematics education. *The Elementary School Journal, 84*(3), 558-581

Sherman, H.J., Christian, M. (1999): Mathematics Attitudes and Global Self-concept: An Investigation of the Relationship. *College Student Journal, 33*(1), 95.

Skemp, R. R. (1976): Relational Understanding and Instrumental Understanding. *Mathematics Teaching, 77*, 20-26.

Tabuk, M. (2018): Prospective primary school teachers` attitudes towards teaching mathematics. *Journal of Education & Learning*, *7*(4), 225-229.

Terwilliger, J., Titus, J. (1995): Gender differences in attitudes and attitude changes among mathematically talented youth. *Gifted Child Quarterly, 39*(1), 29-35.

Tuimavana, R., Datt, N. (2017:. Teachers' Attitude Towards Teaching Mathematics at Upper Primary Levels in Fiji's Primary Schools: A Case Study of the Western Primary Schools. International *Journal of Humanities and Cultural Studies, 3*(4), 272-293.

Yıldızlar, M. (2001): Matematik problemlerini çözebilme yöntemleri [Methods to solve mathematics problems]. *Eylül Publishing. 4,* 471-481.

Author

Abdallah Asli, Babes-Bolyai University (Romania) & Alzhraa School-Arraba (Israel). E-mail: abedallh_asley@yahoo.com

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